CATLINS ESTUARY: 2021/2022 INTERTIDAL SEDIMENT MONITORING SUMMARY

Salt Ecology Short Report 009. Prepared by Barrie Forrest for Otago Regional Council, March 2022

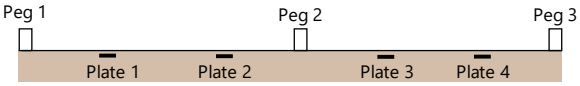
OVERVIEW

Since Dec-2016, Otago Regional Council has undertaken annual State of the Environment monitoring in Catlins River Estuary to assess trends in the deposition rate, mud content, and oxygenation of intertidal sediments. Sediment monitoring is undertaken at two sites (Fig. 1), with the latest survey carried out on 1 December 2021.

Fig. 1. Location of Catlins River Estuary monitoring sites. Site A1 has been replaced Site A, which was in the same general location but washed away prior to the Feb-2019 survey.

METHODS

Estuary sedimentation is measured using the 'sediment plate' method (e.g. Forrest et al. 2021). The approach involves measuring sediment depth from the sediment surface to the top of each of four buried concrete pavers. Measurements are averaged across each plate (n=3) and used to calculate a mean annual sedimentation rate for each site.



A composite sample of the surface 20mm of sediment is collected adjacent to the plates and analysed for particle grain size (wet sieve, RJ Hill laboratories). This approach allows changes in sediment muddiness to be determined even where there are no changes in sediment depth.

Sediment oxygenation is an ancillary biological health variable that is visually assessed in the field by measuring the depth at which sediments show a change in colour to grey/black, commonly referred to as the apparent Redox Potential Discontinuity (aRPD). Results for all indicators are compared to condition ratings of ecological state shown in Table 1.

RESULTS

Table 2 shows a summary of results for the latest survey and their respective condition ratings corresponding to the colours in Table 1.

Table 2. Indicator values and condition ratings from the Dec-2021 survey.

Indicator	A1	B
Sedimentation (mm/yr)*	5.49	7.53
Mud content (%)	3.0	34.6
aRPD (mm)	20	30

* Mean annual sedimentation rate relative to the baseline (n=2 yrs Site A1, n=5 yrs Site B). Five years of data are required to assess a meaningful trend.

Sedimentation rate

The cumulative change in sediment depth over plates at each site is shown in Fig. 2. There has been steady sediment accrual at both sites, with annual mean value exceeding the 2mm/yr guideline value (rated 'poor, Table 1). High variability between plates at Site A1 reflects the dynamic hydrological environment near the estuary entrance (see photo on next page).

Table 1. Summary of condition ratings for sediment plate monitoring

Indicator	Unit	Very Good	Good	Fair	Poor
Sedimentation rate[1]	mm/yr	< 0.5	≥0.5 to < 1	≥1 to < 2	≥ 2
Mud content[2]	%	< 5	5 to < 10	10 to < 25	≥ 25
aRPD[3]	mm	≥ 50	20 to < 50	10 to < 20	< 10

Condition ratings derived or modified from: [1]Townsend and Lohrer (2015), [2]Robertson et al. (2016), [3]FGDC (2012).

Sediment mud content and oxygenation

Sediments were sand-dominated at lower estuary Site A1, whereas the mud content at upper estuary Site B exceeded the biologically relevant threshold of 25% (Fig. 3), and was rated 'poor' (Table 2). Combined with the elevated sedimentation rate, these results suggest there is significant ongoing deposition of muddy sediment in the upper estuary, which may reflect that the dominant catchment land use is pastoral farming (Stevens & Robertson 2017).

The aRPD depths at the two sites ranged from 20-30mm, corresponding to condition ratings of 'good', Table 2). As such, despite the deposition of mud at Site B, the sediment has not become excessively enriched. Neither site showed any other symptoms of excessive enrichment such as prolific algal growths. However, in the wider vicinity of Site B, the estuary margins are characterised by extensive growths of the opportunistic macroalgae *Agarophyton chilense*.

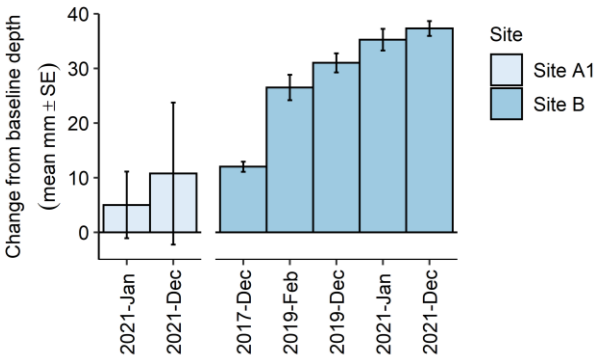


Fig. 2. Change in mean sediment depth over buried plates (±SE) relative to the baseline.

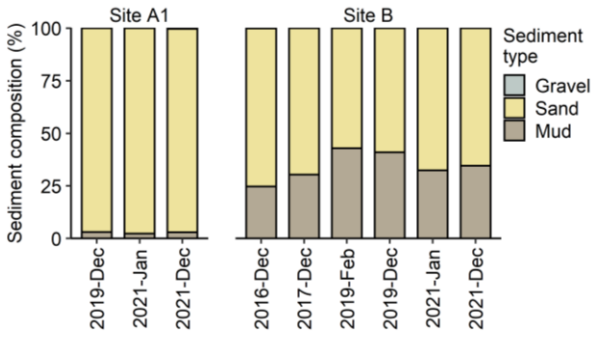


Fig. 3. Sediment particle grain size at each site. The baseline result for each site is also shown.

CONCLUSIONS

The significant sedimentation measured at upper estuary Site B over the last 4 years is consistent with the desposition of catchment-derived muddy sediment. By contrast, sand-dominated Site A1 appears to be exposed to hydrodyamic processes (e.g. scouring and erosion) that will likely limit the accrual of muddy sediments from the catchment. The Dec-2021 results overall show that the upper estuary at Site B and in the wider area is relatively degraded, which reinforces previous recommendations (e.g. Stevens & Rovertson. 2017) to manage catchment inputs to the estuary.

Mobile and undulating sand-dominated sediment at Site A1 (left) compared with mud-dominated upper estuary sediment at Site B (right) in Dec-2021.

RECOMMENDED MONITORING

Continue annual monitoring of sedimentation rate, sediment grain size and aRPD depth, and report results annually via a summary report. Comprehensive reporting should be undertaken 5-yearly as part of 'fine scale' ecological and sediment monitoring (next due in the summer of 2023/24).

REFERENCES

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